Hanford 4th Annual ALARA Workshop
October 21-23, 2002
Program of Presentations and Workshops

MONDAY, OCTOBER 21

Plenary Session, Columbia Room, 8:00

Welcoming address and introduction of Conference Staff and Speakers. Derek Thornton, Conference Chair, Greg Perkins, Radiation Protection Director, Becky Austin, Vice President, ES&H (Fluor Hanford, Inc.)

Keynote Speech, Keith Klein, Manager, Richland Field Office (US Department of Energy)

Keynote Speech, Keith Thomson, President Fluor Hanford, Inc.

Session 1: *ALARA Programs and Administration I*, Columbia Room, 9:45

1-1. The Red Bead Experiment. S.S. Prevette (Fluor Hanford, Inc.)

The "Red Bead Experiment" was an interactive teaching tool that Dr. Deming made use of in his four-day seminars. In the experiment, a corporation is formed from "willing workers", quality control personnel, a data recorder, and a foreman. The corporation's product is white beads, which are produced by dipping a paddle into a supply of beads. The paddle has 50 holes in it, and each hole will hold one bead. Unfortunately, there are not only white beads in the bead supply, but some hazardous red beads. The production of the beads is strictly controlled by an approved procedure.

Various techniques are used to ensure a safe (no red bead) product. There are quality control inspectors, feedback to the workers, merit pay for superior performance, performance appraisals, procedure compliance, posters and quality programs. The foreman, quality control, and the workers all put forth their best efforts to produce a safe product. The experiment allows the demonstration of the effectiveness (or ineffectiveness) of the various methods. Some humor is also included along the way.

Describing the Red Bead Experiment has all the dangers of writing a good movie review. One does not want to give out the complete plot line in the description. Suffice it to say that at the end of the experiment, a Statistical Process Control chart is utilized to examine the results of the experiment. What is discovered is that several of the actions taken (which are commonly seen every day in the workplace) were detrimental to the employees and the workplace, and had no improving effect on the process. The concluding comments point out the hazards of misuse of performance data, and how to properly use performance data in an ALARA environment in order to achieve superior performance.

Session 1 (continued): *ALARA Programs and Administration I*, Columbia Room, 12:30

1-2. Implementation of the ALARA Process in the DOE Cleanup and Closure of the Energy Technology Engineering Center. P.D. Rutherford (the Boeing Company, Rocketdyne Division)

The Rocketdyne Division of the Boeing Company owns and operates the Santa Susana Field Laboratory (SSFL) in Ventura County, California. Research and development of space-based and land-based nuclear power systems was conducted in Area IV of SSFL for the Atomic Energy Commission, and later the Department of Energy, from 1955 to 1989. Subsequently, Rocketdyne has performed decontamination and decommissioning (D&D) of buildings and environmental remediation of land. To date, 25 of 28 facilities have been remediated and surveyed, 20 have been released for unrestricted use, and 5 are pending release.

Implementation of the ALARA process in the remediation of buildings and land at the Energy Technology Engineering Center (ETEC) has been effective in removing residual contamination to levels far less than federal and state-approved cleanup standards. Boeing cleanup standards, approved by the DOE and the California Department of Health Services are based on DOE Order 5400.5 (Regulatory Guide 1.86) surface contamination limits and soil concentration limits based on a TEDE of 15 mrem/y to a residential user.

Post-remedial measurements and sampling are used to calculate individual and collective doses for a variety of exposure scenarios including workers occupying a released building, an on-site resident, disposal of building debris and soil to municipal landfills, and recycling scenarios. All calculated doses are small compared to dose limits and in most cases trivially small. Assuming that the linear-no-threshold model of radiation risk is valid at these low doses, a theoretical lifetime cancer risk is also calculated. These theoretical risks meet the Superfund risk range of 10^{-6} to 10^{-4}, and in the case of building debris disposal and recycling are many orders of magnitude below the 10^{-6} risk level.

1-3. *Disposal Of 105F Fuel Storage Basin Waste At The Environmental Restoration Disposal Facility (ERDF): A Lesson In Applied Health Physics.* K.C. Burns (Eberline Services Hanford, Inc.)

The Environmental Restoration Disposal Facility has taken on the challenge of receiving more diverse types of radioactive waste, and found an increasing need to take a more versatile and proactive approach to problem solving. This approach must meet the needs of the customer, while maintaining the highest degree of radiological control. This cannot succeed without clearly stating the goals of the project, and establishing communications between contractors, sub-contractors, field personnel and the RadCon organization. A commitment must be made to dedicate available talents at every step of the process, from the conceptual phase through implementation.

This paper supplies one example of a process where the RadCon organization at the ERDF was challenged to devise a method of disposal, and then assist the customer in streamlining the process. It shows how a graded approach was used in applying ALARA and ISMS principles to safely plan and execute the task of disposing of waste containing non-matrixed, highly contaminated materials. This presentation will review the real world problems that were encountered by the staff at the ERDF when planning this work. It will also detail each of three phases of disposal, spanning a period of 9 months, showing the successes and lessons gained from each.

1-4. *Triennial Self-Assessment in Accordance with 10 CFR 835.102 at CH2M Hill Hanford Group, Inc.* R.L. Brown (CH2M Hill Hanford Group, Inc.)

There exists within the regulations governing DOE facilities the requirement to assess the implementation of the Radiation Protection Program within a 36-month cycle. The implementation of an effective assessment program goes beyond the bare essentials of the requirements and incorporates a multi-tiered approach to program review and effectiveness of implementation. Such an approach is essential from the Integrated Safety Management perspective in that it provides the crucial element of Feedback, which leads to Continuous Improvement. This presentation will cover the elements of an effective assessment program as implemented at CH2M Hill Hanford Group Inc.

Session 2: *The ALARA Process Amplified Through Planning and Technology for Decontamination and Decommissioning (D&D) Operations* (Parts 1 and 2 of an 8-Hour Course). Kennewick/Richland/Pasco Room, 12:30

2-1. *Safety and Health Management for D&D Operations.* JE Tarpinian (Bechtel Hanford, Inc.)

Part 1 of the course will address the following:

- Multiple hazards at the worksite
- Hazard identification and Analysis
- Development of controls and implementation
- Evolution of safety management

2-2. *RadCon Management for D&D and Environmental Restoration (ER) Operations.* GM Ceffalo (Bechtel Hanford, Inc.)

Part 2 of the course will address the following:
- RadCon program planning for D&D and ER activities vs. planning for operations
- Integration of the MARSSIM process with standard RadCon practices
- The handoff of ISMS principles to projects through the program
- How to build a scalable ALARA program that addresses a graded approach to hazards

TUESDAY, OCTOBER 22

Session 3: *ALARA Programs and Administration II,* Columbia Room, 7:30

3-1. *Building an Effective ALARA Program*. O.D. Berglund (Fluor Hanford, Inc.)

This presentation will discuss a unique method of building an effective ALARA Program. This method relies heavily on employee involvement, employee empowerment, and management support. The presentation will discuss the pro's and con's of having a "Rubber-meets-the-Road" versus a "Management-heavy" ALARA program. We will discuss how to build an awareness program through the use of campaigns that center around team-building the ALARA Program.

3-2. *Integration of Formal Job Hazard Analysis & ALARA Work Practice.* D.P. Nelsen (Fluor Hanford, Inc.)

Comprehensive safety oversight requires a programmatic approach to work planning that extends beyond the boundaries of traditional ALARA oversight. The Automated Job Hazard Analysis data base provides a tool for effectively evaluating radiological, chemical and human health risks as part on an integrated safety management system. By fostering discussions between the personnel conducting the work, identifying potential hazards and establishing appropriate administrative controls, the AJHA review process provides Fluor with a right tool for effective work planning.

As a practical matter, only a small number of injuries occur where work is properly pre-planned. Unless the right questions are asked as part of pre-job planning, institutionalizing of effective safety controls does not take place. The role of the workers at Hanford centers on providing both the skill and technical expertise required to radiological, chemical and human health risks encountered on the job.

The mark of safety excellence within Fluor rests upon the ability to identify and control hazards before workers are exposed to unrecognized risks. Using the AJHA review process, safety professionals facilitate the oversight of job hazard control and help foster at team approach to work planning. Integration of a team based planning process with a computer based review process has allowed AJHA review to extend the boundaries of safety management systems beyond the boundaries of ALARA.

3-3. *Workplace Air Sampling at Tank Farm Facilities*. R.L. Brown (CH2M Hill Hanford Group, Inc.) and J.L. Kenoyer (Dade Moeller and Associates, Inc.)

Performing work in areas with high levels of removable radioactive contamination requires aggressive air sampling programs. Take these same conditions and perform the work out of doors, exposed to the environment, and with severe limitations on the ability to apply ventilation, and the challenges are intense. This session will focus on strategies and techniques for applying air sampling to outdoor environments for the broad range of work activities necessary to safely manage and prepare for eventual vitrification of the highly-radioactive waste contained at tank farms. This discussion will include lapel air sampling, representative air sampling in work areas, and confirmatory sampling that addresses environmental needs.

3.4. *Implementation of the ALARA Process in the DOE Cleanup and Closure of the Energy Technology Engineering Center.* P.D. Rutherford (the Boeing Company, Rocketdyne Division)

(See abstract, Page 1).

Session 4: *The ALARA Process Amplified Through Planning and Technology for Decontamination and Decommissioning (D&D) Operations* (Parts 3 and 4 of an 8-Hour Course). Kennewick/Richland/Pasco Room, 07:30

4-1. Planning an Environmental Restoration Project. RB Sitsler (Pacific Northwest National Laboratory)

Part 3 of the course will address the following:
- How the ISMS Core Functions can be used to outline the planning process
- The steps taken in the planning process
- The details of each step in the planning process

4-2 Executing Radiological Projects for D&D Operations. KC Funke (Bechtel Hanford, Inc.)

Part 4 of the course will address the following:
- Why an integrated safety approach to job planning is essential
- The need for innovation when implementing a job plan
- The importance of continual monitoring of effectiveness of engineered controls (metrics)

Session 5: *Non-Radiological Applications of ALARA Principles,* Benton/Franklin Room, 7:30

5-1. Using ALARA Principles for NonRadiological Exposures: the Beryllium Lesson. T.K. Takaro, K.B. Ertell, J. Abbotts, N. Judd (University of Washington)

ALARA principles have long been accepted as a standard practice in health physics, and are based on the concept that there is no accepted lower threshold below which health effects from radiation exposure do not occur. However, ALARA principles are a subject of some controversy for non-radiological exposures, such as chemicals. In recent years, chronic beryllium disease has re-emerged as an occupational disease. Disease cases are being seen in individuals who were exposed at much lower levels than were thought to produce disease, and a lower threshold of exposure thought to produce health effects has not been identified. An ALARA approach appears to be indicated for beryllium exposure until studies can better identify and quantify the risk factors for exposure. This presentation will outline the history of beryllium exposure assumptions and disease, including examples from Hanford; the challenges and benefits of adopting ALARA for beryllium; and how these findings may affect future assumptions about safe exposure levels for other chemical agents.

Lunch Service, 11:00-12:30

Session 6, *Engineered Controls and Equipment I,* Columbia Room, 12:30

6-1. Pit Viper -- Today's ALARA Success and Tomorrow's Improvements. S.A. Bailey (Pacific Northwest National Laboratory), D.P. Niebuhr (CH2M Hill Hanford Group, Inc.)

The Pit Viper, a remote system for the cleanup and refurbishment of tank farm equipment pits, was successfully used at Hanford in the C-104 heel pit in December, 2001. During this effort, the project realized nearly a 50% reduction in dose, and demonstrated that the Pit Viper could work 60% longer in a standard shift than current practice. The deployment of this equipment was a complete success and clearly demonstrated the ability to do pit work remotely. Future potential for ALARA savings is great in pits where dose rates and contamination levels are too high for personnel to work. A minimum of 3 out of 15 pits will benefit from the use of the Pit Viper, and one out of 15 will have radiological conditions that preclude current practices (personnel using long-handled tools).

In this deployment, the project team learned many things about how pit work can be completed and how enhancements to the Pit Viper can improve upon the already strong ALARA focus of the work. Some of these improvements include:

- Proposing a new containment tent design with the ante-room relocated and glove ports available for minor tooling problems (fixing nozzle heads, etc.)
- Designing tooling specifically for use by a robot.
- Utilizing fiber-optic or wireless communications
- Integrating a system power generator so that the Pit Viper is completely independent of Tank Farm resources.
- Refocus planning efforts around the use of remote systems rather than foce-fitting remote systems into current baseline resources/activities.

6-2. *New Sample Carriers at Hanford's 222-S Laboratory: An ISMS Success Story.* N.L. Kirner (Kirner Consulting), V.L. Massie, D.M. Squier, Jr., O.D. Berglund, L.J. Call, C.W. Howald, R. Akita, D.L. Kelly (Fluor Hanford, Inc.).

Due to ergonomic concerns, a lighter, more ergonomically designed sample shield is needed at Hanford's 222-S Laboratory Complex. As a matter of design specification, this shield should be at least as effective as the existing T-handle carrier in use at the 222-S Laboratory to shield radiation from small vial samples. Due to environmental and safety concerns, the new shield should not rely on lead for its shielding and should be no more than 7 pounds. This paper compares and contrasts the effectiveness of the old sample carrier (T-Handle Carrier or THC) as it relates to a new prototype sample carrier (Single-Sample Carrier or SSC) that is fabricated from a tungsten/polymer with ergonomically designed handling equipment. Performance related to shielding effectiveness, cost, handling ease, ability to be decontaminated, storage efficiency, and waste minimization were evaluated. Results of suitability tests are included.

6-3. *Development And Evaluation Of A Neutron-Photon Shield For Transuranic Waste Containers.* R.J. Wishau, J.M Castro, and R.L. Huchton (Los Alamos National Laboratory)

The Los Alamos National Laboratory (LANL) Operational Health Physics Group in conjunction with the Nuclear Materials Technology Division Waste Management Group has developed a wrap-around shield for use with 55-gallon (0.208 cubic meter) drums containing transuranic (TRU) waste.

The shield or "drum cover" as it is called, is innovative in its ability to shield both neutron and gamma photons associated with TRU waste. The shielding materials are comprised of a 0.275-inch (7mm) thick sheet of borated polyurethane for neutrons, and two sheets of composite lead vinyl fabric (equivalent to 0.35 mm of lead) for shielding photons.

The drum covers have proven their relative effectiveness. Shielding tests have shown that the drum covers are highly effective in attenuating photons and are somewhat effective for shielding neutrons. Total (neutron and photon) radiation reduction for actual TRU drums has been as high as 87%.

6-4. *Two Apparatuses for the Routine Reduction of Dose to the Extremities While Performing X-Ray Diffraction and Size Measurements on Radioactive Specimens.* D.M. Strachan (Pacifc Northwest National Laboratory)

At PNNL, we are studying the changes in chemical and physical properties of pyrochlore- and zirconolite-based titanates that were to be used as immobilization forms for excess weapons-ready plutonium. To study the effects of radiation damage as the ^{239}Pu decays to ^{235}U, we prepared approximately 120 specimens each containing about 0.1 g ^{238}Pu (1.5 Ci). These specimens, measuring about 2 mm high and about 10 mm in diameter are difficult to handle, especially when one's hands are in glovebox gloves. Because the handling time during which the specimens were to be measured was long, the potential dose to the extremities was significant. Periodically, we also needed to obtain x-ray diffraction patterns from the same specimen while maintaining the x-ray diffraction unit contamination free.

To minimize the time required and to increase the accuracy of our measurement of a specimen's dimensions, we designed and built a laser-based system to measure the dimensions of the right-cylindrical specimens. This laser-based device consists of two orthogonal (90° apart) laser curtains with which we measure simultaneously the height and diameter of each specimen. The specimen is placed on a rotating table and several thousand measurements made with every four averaged and recorded with a computer-based data acquisition system. The specimen need only be handled as it is transferred from its storage container to the table and returned, dramatically reducing the dose to the extremities. Because the specimens are handled about one-tenth of the time required by the initial method, the dose to the workers' extremities was reduced by 48 rem for the overall study.

To contain the spread of contamination from the radioactive specimens and to eliminate the need to locate the XRD unit in a radioactive contamination area (CA), we designed a special XRD specimen holder that provides sealed containment of both monolithic and powder specimens and recovery of the specimen. This XRD holder effectively contains both ^{239}Pu and ^{238}Pu while providing a window transparent to x-rays. The design ensures that the integrity of any monolithic specimen is protected so that it can be returned to the long-term storage test. Because the XRD does not need to be in a CA, a radiological release survey is no longer needed to remove the specimen from the XRD, thus reducing the worker's extremity exposure. We expect an overall reduction in the dose to the extremities of 9 rem for the life of the study.

Workshop 1: *Radioactive Contamination Control Practices*, Kennewick/Richland/Pasco Room, 12:30, L.O. Waggoner (Fluor Hanford, Inc.)

Workshop will include a discussion of fundamental contamination control practices and new techniques used for radiological work. This is intended to be very informative and include hands-on exercises to provide the attendees with an appreciation of the methods being used to confine contamination spread.

Session 7, *Application of ALARA Concepts to Environmental Hazard Controls,* Benton/Franklin Room, 12:30

7-1. *Two Hanford Land Clearance Activities*. W.J. Millsap (Fluor Hanford, Inc.)

The presentation will discuss the radiological clearance of the WNP-1&4 sites and the plans for the clearance of the Hanford Reach National Monument. It will discuss the reasons that the land is being cleared, the requirements, the general process of clearance and the schedule. It will cover the use of a stakeholder advisory group, the historical site assessments, RESRAD calculations, requests for authorized limits, and survey plans and surveys.

7-2. *ALARA Effects of Noxious Weed Control on Radioactive Waste Storage & Disposal Sites at the Hanford Site*. R.C. Roos (Fluor Hanford, Inc.)

Noxious weeds are a legal classification of plants identified by species in the Washington Administrative Code. Characteristics that define noxious weeds are: 1) non-native, 2) highly aggressive or invasive, and 3) not easily controlled using ordinary control practices.

Several of the noxious weed species present on the Hanford site have the ability to infest large areas of the site, permanently degrading the ecology. Many of the characteristics that make noxious weeds threats to ecology and agriculture also make them serious problems if they invade sites with underground radioactive material.

Characteristics that may prove problematic include extensive root systems that are impossible to kill with a single application of herbicide. Root segments that remain alive may sprout shoots up to 5 years after the above-ground portion of the plant has been killed. Prolific production of seeds that can remain viable in the soil over ten years after plants have been controlled. Windborne seeds can be carried many miles from the parent plant. If seeds are contaminated from a parent plant growing on a waste site, dispersal of the contamination could not be controlled.

The Hanford Site has an active program for control of noxious weeds to protect the ecology of the Hanford Site, and to prevent those species from invading waste sites, thereby increasing potential for contamination spread.

7-3. *ALARA Effects of a Program to Control Biological Vectors of Radioactive Contamination at the Hanford Site in the 4th Year of Operation*. A.R. Johnson and G.D. Perkins (Fluor Hanford, Inc.) J.B. Hall (Department of Energy, Richland Office.)

The Biological Control Program was instituted in 1999 to fill an ALARA void identified in DOE Inquiry Report *The Control of the Spread of Radioactive Contamination Due to Biological Transport at the Hanford Site* (DOE-RL 98-EAP-584, January 1999). The Inquiry Report noted the significant increase in the growing number of incidents of radioactive contamination spread by biological vectors (e.g., tumbleweeds and mice) from 1994 through 1998. FluorHanford initiated a subsequent investigation, agreed with the DOE report, and responded to the findints by committing to creation of a new integrated biological control program. The new Program was created and documented in *Integrated Biological Control Management Plan* (HNF-MP-5824).

The new Program attacked the growing problem through four approaches

- Expanded environmental surveillance in conjunction with Near-facility monitoring
- Clean up of radioactive contamination and sources when they are found
- Control of biological vectors (i.e., vegetation & animals) in a coordinated manner
- Restoration of disturbed waste sites with engineered & natural biological barriers

The Program has contributed to ALARA by building multidisciplinary teams (i.e., having Radiation Control Technicians, Teamsters, & Nuclear Chemical Operators in one team) with the combined capability of accomplishing clean up without waiting to bring in a specialized craft and thereby resulting in delays and additional contamination spread. Results have been significant. Animal caused contamination incidents which had increased from 12 in 1994 to 46 in 1998, decreased to 17 in 1999, 13 in 2000, 10 in 2001, and a current low of 3 in 2002. Vegetation caused contamination incidents, which had increased from 20 in 1994 to 51 in 1998, increase to 84 in 1999 as searches were expanded, but decreased to 65 in 2000, 31 in 2001, and a current low of 11 in 2002.

7-4. ALARA Concepts as Reflected in Pest Control's Integrated Pest Management (IPM) Strategies & Tools. R.F. Giddings (Fluor Hanford, Inc.)

The ALARA concept may be applied to protection from harmful and nuisance pest animals to reduce health and safety risks to workers and the public. Common Hanford pests are described, as are strategies to lower exposure to the hazards they present.

7-5. Integrated Pest Management (IPM) Strategies and Tools: Vegetation Management. J.M. Rodriguez (Fluor Hanford, Inc.)

Vegetation Management Operation's goal is to prevent growth of deep-rooted vegetation (that has the potential to uptake radionuclides and spread contamination) on radiological waste sites. This is accomplished through IPM strategies that use manual, chemical and biological control methods. IPM strategies use site-specific information to formulate a recommendation for control of undesirable vegetation. These strategies outline the importance of communication and education between Vegetation Management Operations and facility owners to best implement each recommended strategy to prevent the growth of unwanted weeds at these sites.

WEDNESDAY, OCTOBER 23

Session 8, *Engineered Controls and Equipment II,* Columbia Room, 7:30

8-1. Spent Nuclear Fuel Project Repair of Contaminated Underwater Manipulators. S.C. Tilton and W.A. Decker (Fluor Hanford, Inc.)

The spent Nuclear Fuel Project uses two underwater manipulators to sort, load, and inspect spent nuclear fuel for shipping to the Cold Vacuum Drying facility. The manipulators extend from a manipulator rail system into the contaminated fuel pool and are operated remotely by use of a CCTV system. To repair the manipulators they must be raised out of the water and placed in a safe condition for millwrights and electricians to perform the repair. As spent fuel has been processed the contamination levels on the manipulators has increased that require stringent contamination control and airborne control measures to be taken. This paper recounts the increasing contamination control and worker protection measures that have been applied to the repair work as a result of increasing contamination levels. It describes what has been successful and unsuccessful.

8-2. *Innovative ALARA Techniques Used at Hanford*. L.O. Waggoner (Fluor Hanford, Inc.)

The Hanford Nuclear Reservation occupies a 560 square mile area in the state of Washington, which is in the Northwest part of the United States. The facilities at Hanford were used to produce nuclear weapons materials during World War II and continued until the Cold War ended in 1989. Facilities are being shut down, placed in a safe condition, and being turned over for D&D. We still have a lot of radiological work remaining to clean up in, and around facilities, remove millions of gallons of highly radioactive waste, and stabilize the environment. At Hanford, facilities contain a myriad of radioactive isotopes that are located inside plant systems, underground tanks, and the soil. This means we encounter toxic and hazardous materials that are also highly contaminated and emit alpha, beta, gamma, and neutron radiation. During the last few years, Hanford has concentrated efforts to improve how radiological work gets accomplished using better engineered controls. An ALARA Center of Technology was established to show workers the latest tools, equipment, and work practices used in the industry. An enhanced radiological work planning process emphasizes using team planning for medium and high-risk radiological work. Lessons learned are documented and some of our success stories are worth sharing.

8-3. *Demonstrated Retrieval of Transuranic Waste from Operable Unit 7-10 (Pit 9) at the Idaho National Engineering and Environmental Laboratory.* W.R. Horn (Bechtel BWXT Idaho, LLC)

Bechtel BWXT Idaho, LLC, management and operating contractor at the Idaho National Engineering and Environmental Laboratory (INEEL), has U.S. Department of Energy (DOE) approval to retrieve, characterize and store transuranic (TRU) waste on an interim basis. This demonstration retrieval project uses a commercial excavator, operated from outside a confinement structure, to remove waste inside the structure. The waste is placed in carts and transported to gloveboxes that are connected to the confinement structure, where personnel can safely inspect, characterize and package material.

The design of this temporary facility incorporates the following radiological ALARA features: (1) a full-scale equipment mockup to conduct prestart activities, (2) a single confinement structure for excavation, (3) ventilation confinement zones, (4) remote excavation of highly contaminated waste, (5) a fog and spray system for contamination control inside the excavation confinement structure, (6) drum bagout enclosures under the gloveboxes for contamination control during repackaging, and (7) the ability to take and count highly contaminated radiological smears and air samples in total containment using a specifically designed glovebox. Three of the above design features are unique radiological control features. These three features are a single confinement for high-level alpha work, a water fog/spray for contamination control, and a commercially available excavator installed with the operator outside of the primary containment.

8-4. *Innovative Containment Uses at Pacific Northwest National Laboratory.* L.A. Page, Jr. and R.E. Thornhill (Pacific Northwest National Laboratory)

"Necessity, who is the mother of invention," said Plato...

The Shielded Facility Operations group at PNNL had some unusual tasks over the last year. Unusual and innovative containment systems were invented, as a matter of necessity. Most of them were developed for decontamination efforts and all were very successful at controlling very high levels of contamination. Future possibilities will be examined as well.

Workshop 2, *Radiological Control Containments*, Kennewick/Richland/Pasco Room, 7:30, J.L. Eby (Fluor Hanford, Inc.).

Workshop will cover containments from catches, glovebags to tents. Their uses and what makes a good containment. Include hands on with the attendees on proper attachment of containments, installing containment gloves, filters, drains and sleeves. Will assemble a glove bag and make it ready for use, including ventilation.

Lunch Service 11:00-12:30

Session 9, *ALARA Workshop Highlights*, Columbia Room, 12:30

9-1 *Use Of HEPA Filtered Ventilation For Radiological Work At Hanford.* J.L. Eby (Fluor Hanford, Inc.)

When entering radiological controlled systems and areas, workers need to practice techniques that reduce radiation exposure to the worker, limit the spread of radioactive contamination and minimize the production of radioactive waste. Use of localized HEPA filtered ventilation to capture radioactive particles produced during work is one of the better engineered control methods. This presentation will show what makes a good HEPA filtered ventilation system and what additional items make the system more effective. Additionally, I will discuss other engineered controls used with the HEPA filtered ventilation systems at Hanford that have improved work, and resulted in less radiation exposure to the worker, minimized the spread of radioactive contamination and reduced radioactive waste production. I will also emphasize how workers are trained at the Fluor Hanford ALARA Center of Technology to use localized HEPA filtered ventilation as a engineered tool for radiological controlled work.

9-2 *New Sample Carriers at Hanford's 222-S Laboratory: An ISMS Success Story.* N.L. Kirner (Kirner Consulting), V.L. Massie, D.M. Squier, Jr., O.D. Berglund, L.J. Call, C.W. Howald, R. Akita, D.L. Kelly (Fluor Hanford, Inc.).

(See Abstract Page 5).

9-3 *Using ALARA Principles for NonRadiological Exposures: the Beryllium Lesson.* T.K. Takaro, K.B. Ertell, J. Abbotts, N. Judd (University of Washington)

(See Abstract Page 4).

Workshop 3, *Ventilation as an Engineered Control,* Kennewick/Richland/Pasco Room, 12:30, John Kremer, NFS/Radiation Protection Systems

Closing Session, Columbia Room, 2:30

Closing Ceremony. Derek Thornton (Fluor Hanford, Inc.)